

MAPPING AND MONITORING SPATIOTEMPORAL DESERTIFICATION PATTERNS IN THE STEPPIC BELT OF ALGERIA



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MOTIVATIONS

- Desertification is a major environmental issue that threatens many parts of the globe.
- 40% of the Algerian steppe is classified as highly vulnerable.
- No existing study has investigated the large-scale evolution of this phenomenon in this region over a long period of time.

EO DATA SOURCES

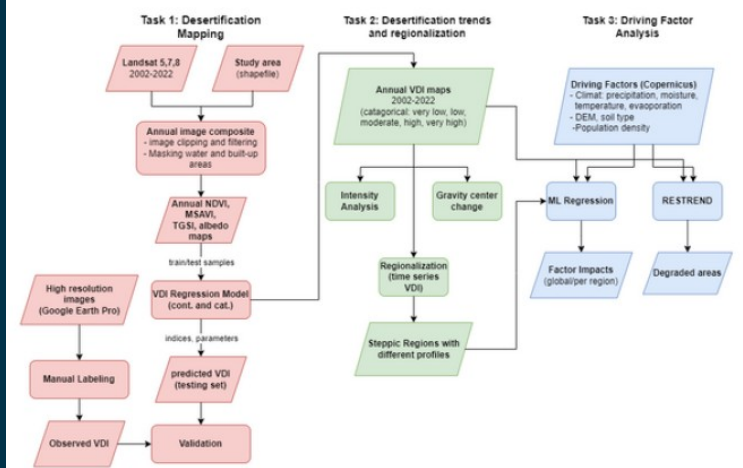
- USGS Landsat 5,7,8 (Level 2, Collection 2, Tier 1)
- ESA WorldCover 10 m 2021
- Google Earth Pro (High Resolution Images)
- ECMWF ERA5 (Climate Data).

This project aimed to map, monitor and analyse the desertification in the steppic region in Algeria using earth observation data. Specifically, we developed a workflow to reveal the main spatiotemporal evolution patterns of this problem over the last two decades (2002-2022) and expose its most prevailing driving factors.

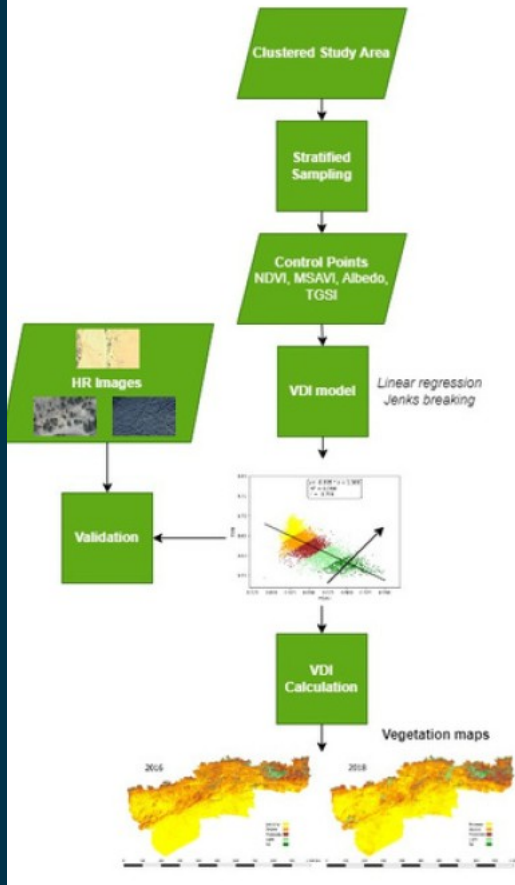
APPROACH

- Harness the availability of long time series of EO data.
- Develop an analytical workflow to map the spatiotemporal evolution of desertification from
- Divide the area into contiguous regions with homogeneous and explainable characteristics and trajectories.
- Investigate the impact of climatic and human factors using machine learning.

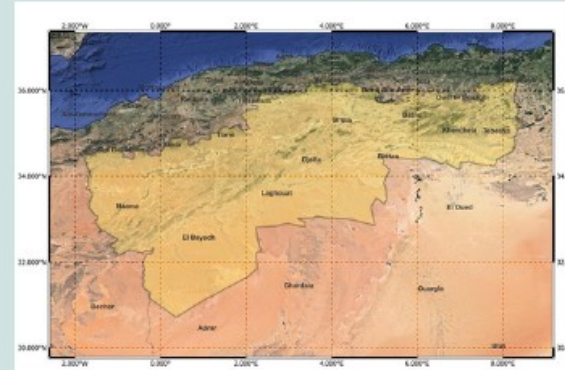
WORKFLOW



ANNUAL VEGETATION DENSITY INDEX (VDI) MAPS

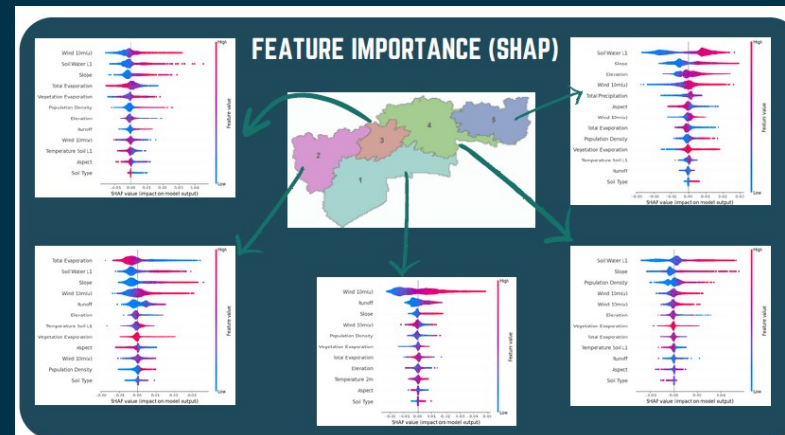
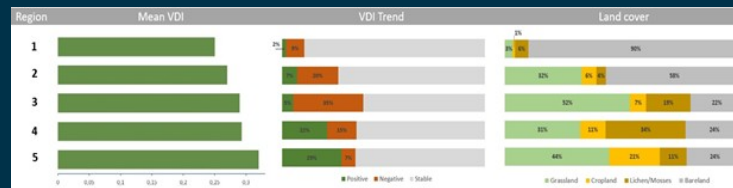
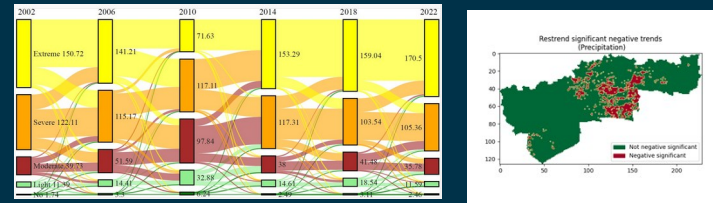
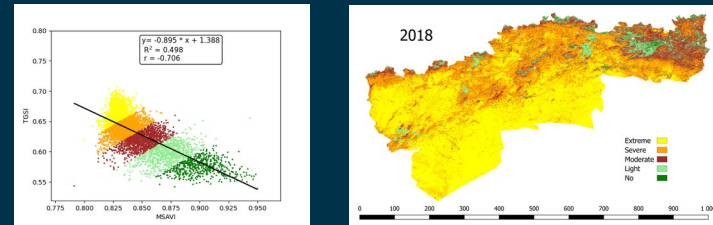


Steppic Belt of Algeria.
11% of the territory.



TIME RANGE
2002 - 2022

- 'Cyclic transitions between adjacent vegetation classes, in particular between 'Extremely Severe' and Severe'
- Mostly, steady increase in areas of extremely scarce vegetation and a decrease in areas of moderate vegetation.
- Northward expansion of desert lands in the western and central parts of the steppe from 2010, while greener areas appear to be increasingly grouped in the east from 2014.
- Partitioning of the steppe into 5 regions with different vegetation trajectories over the study period
- Most of the areas with significant residual negative trends against precipitation are located in the central region, known for its important agricultural and pastoral activities, covering an area of more than 37000 km², or about 11% of the total steppe.
- In-depth analysis of the most influential factors in each region using SHAP analysis



- As a follow up of this research we aim at:
- Exploring more advanced techniques for more integrated and automated usage of high resolution imagery either as data input or ground truth provider to define vegetation indices.
 - Deepening and refining our understanding of drivers and establish causality at a narrower scale (i.e. at region level) by integrating other global and local data sources, such as land cover and livestock. This entails building models that consider land use and vegetation types.